Prince George Ambient Air Monitoring Program
2001 Air Quality Data Summary

INTRODUCTION

The 2001 Prince George Air Quality Data Summary summarizes the data of the joint government/industry program to monitor reduced sulphur (TRS), sulphur dioxide (SO_2), nitrogen oxides (NO_x), particulate less than ten microns (PM_{10}), particulate less than two and half microns ($PM_{2.5}$), and ground level ozone (O_3) in Prince George.

Interpretation of the data is not provided in this summary report, but will be available in the final Annual Air Quality Report. Anyone wishing further information on the data in this summary or on the monitoring network should contact one of the people listed at the bottom of this page.

HIGHLIGHTS

a) The total reduced sulphur (TRS) Provincial Level A one-hour objective (7µg/m^3) was exceeded a maximum of 13.2% of time, at the Jail station, and a minimum of 3.0%, at the Lakewood station. TRS levels in 2001 exceeded the Provincial Level B one hour objective (28 µg/m^3) at the Plaza and Jail stations (0.1% and 0.2% of time, respectively). The annual average for 2001 at the Jail was the lowest since monitoring began and annual averages for five out of the last six years were less than 2.7 ug/m^3. The six lowest annual averages at Plaza were recorded in the past seven years.

b) The Plaza and the Jail site recorded SO_2 annual averages of 9.5 µg/m^3 and 12.1 µg/m^3, respectively, which were higher than those recorded in the past two years. The CBC station recorded the highest one-hour average concentration of 969 µg/m^3, the highest level in seven years of measurement at this site.

c) Two out of the four non-continuous PM_{10} stations showed lower annual averages in 2001 compared to the previous year, whereas two other (residential) sites showed levels similar to the previous year. All four sites recorded the lowest annual average since monitoring began at those sites. Lakewood recorded the lowest annual average of 13.9 µg/m^3, whereas the CNR site recorded the highest annual average of 18.0 µg/m^3. The BCR site recorded the greatest number of exceedances of the Level B daily criteria (50 µg/m^3) for the continuous monitoring sites. Levels at the BCR Gladstone and Plaza sites were the similar to the previous year. The $PM_{2.5}$ measured with the continuous monitor at the Downtown-Plaza station also showed similar levels to those in 2000. A decreasing trend in $PM_{2.5}$ is shown for 1995-2001.

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1. TOTAL REDUCED SULPHUR (TRS) RESULTS

TRS describes a group of sulphur compounds containing gases made up primarily of four compounds; dimethyl disulphide (DMDS), dimethyl sulphide (DMS), methyl mercaptan (MESH), and hydrogen sulphide (H_2S).

These compounds are largely by-products of the pulping process, that is, these compounds are not added directly but form because of the use of other sulphides in the pulping process. Pulp mills using the kraft process emit the largest amounts of TRS (in Prince George) followed by oil and gas processing plants (refining) and to a small extent automobiles (catalytic converters). Natural sources include swamps, bogs, and marshes.

Tables 1.1 to 1.3 list monthly and annual summaries of TRS concentrations for each of the Prince George TRS ambient air stations for 2001. Monthly averages ranged from a high of 4.3 $\mu g/m^3$ at Jail (January) to a low of 0.1 $\mu g/m^3$ at Lakewood (April and May). Jail had the highest annual average followed by Plaza and then Lakewood.

Table 1.1
2001 Monthly Summary of TRS Data at Jail

	Monthly Average	No. of 1-Hour Values		Maximum Hourly Average	No. of Daily Values		Maximum 24 Hour Average
	($\mu g/m^3$)	>7$\mu g/m^3$	>28$\mu g/m^3$	($\mu g/m^3$)	>3$\mu g/m^3$	>6$\mu g/m^3$	($\mu g/m^3$)
January	4.3	199	4	37	13	6	20.2
February	4.1	169	1	31	16	8	13.4
March	1.6	74	1	30	6	5	9.1
April	1.1	35	0	17	4	0	4.6
May	1.0	41	1	30	6	0	7.2
June	0.7	23	0	16	1	0	5.5
July	0.8	19	0	24	2	0	4.6
August	2.5	95	3	37	9	4	13.1
September	2.6	121	1	30	10	5	11.3
October	1.4	62	1	28	4	3	10.7
November	3.4	156	1	35	11	8	15.7
December	2.7	112	0	18	11	3	8.3
Annual	**2.2**	**1106**	**13**	**37**	**93**	**42**	**20.2**

B.C. Ambient Air Quality Objectives Total Reduced Sulphur (TRS)	Level A	Level B
One Hour Average	7 $\mu g/m^3$	28 $\mu g/m^3$
24 Hour Average	3 $\mu g/m^3$	6 $\mu g/m^3$

Table 1.2
2001 Monthly Summary of TRS Data at Plaza

	Monthly Average ($\mu g/m^3$)	No. of 1-Hour Values		Maximum Hourly Average ($\mu g/m^3$)	No. of Daily Values		Maximum 24 Hour Average ($\mu g/m^3$)
		>7$\mu g/m^3$	>28$\mu g/m^3$		>3$\mu g/m^3$	>6$\mu g/m^3$	
January	4.2	198	4	35	12	7	21.0
February	3.3	129	0	24	13	6	13.2
March	1.0	39	0	13	4	0	4.8
April	0.6	10	0	9	0	0	2.9
May	0.5	11	0	20	0	0	2.8
June	0.4	8	0	14	0	0	2.3
July	0.3	5	0	14	0	0	2.0
August	1.5	67	0	18	7	1	6.5
September	1.4	60	1	31	6	0	5.9
October	0.8	33	0	11	3	0	5.5
November	2.5	135	0	13	9	5	9.8
December	3.4	187	0	18	14	6	10.5
Annual	**1.7**	**882**	**5**	**35**	**68**	**25**	**21.0**

Table 1.3
2001 Monthly Summary of TRS Data at Lakewood

	Monthly Average ($\mu g/m^3$)	No. of 1-Hour Values		Maximum Hourly Average ($\mu g/m^3$)	No. of Daily Values		Maximum 24 Hour Average ($\mu g/m^3$)
		>7$\mu g/m^3$	>28$\mu g/m^3$		>3$\mu g/m^3$	>6$\mu g/m^3$	
January	2.0	95	0	23	6	5	13
February	1.1	24	0	17	2	1	7
March	0.2	1	0	7	0	0	1.6
April	0.1	0	0	3	0	0	0.7
May	0.1	0	0	4	0	0	0.8
June	0.2	0	0	3	0	0	1.0
July	0.3	0	0	3	0	0	1.3
August	0.3	4	0	7	0	0	2.2
September	0.5	9	0	10	0	0	2.9
October	0.5	9	0	10	2	0	4.1
November	1.7	33	0	16	5	1	7.3
December	1.9	74	0	17	6	2	8.1
Annual	**0.7**	**249**	**0**	**23**	**21**	**9**	**13.0**

1.1 TRS Annual Trends

The TRS data from the Plaza (1980-2001), the Jail (1981-2001), and Lakewood (1982-2001) stations were examined to reveal trends in Prince George. The following tables (Table 1.4 - Table 1.6) summarize the TRS data from the three stations over the last twenty to twenty-two years.

A major improvement in TRS levels occurred from 1988 to 1991. Since 1991 TRS levels have declined gradually. The annual average concentrations for Plaza and Jail are some of the lowest since the monitoring program started. Annual averages at the Plaza and Jail stations are approximately 80% lower than the 1986-1988 averages. Exceedances of the Level B one-hour objective were recorded at Plaza and Jail, although the frequency has declined over the past decade.

Table 1.4
Annual Trend Summary of TRS Data at Jail

Year	Annual Average ($\mu g/m^3$)	No. (%) of 1-Hour Values >7$\mu g/m^3$	No. (%) of 1-Hour Values >28$\mu g/m^3$	Maximum Hourly Average ($\mu g/m^3$)	No. (%) of Daily Values >3$\mu g/m^3$	No. (%) of Daily Values >6$\mu g/m^3$	Maximum Daily Average ($\mu g/m^3$)	No. of hours Instrument Operated
1981	7.2	1673 (21.7%)	638 (8.3%)	177	151 (47.0%)	121 (37.7%)	59.6	7701
1982	8.8	1169 (23.8%)	519 (10.6%)	149	125 (61.0%)	99 (48.3%)	53.5	4915
1983	11.0	2051 (27.3%)	1066 (14.2%)	156	184 (58.8%)	151 (48.2%)	70.2	7511
1984	6.5	1341 (17.6%)	593 (7.8%)	170	136 (42.8%)	109 (34.3%)	54.8	7638
1985	6.4	1483 (19.1%)	546 (7.0%)	149	145 (44.8%)	117 (36.1%)	44.9	7773
1986	9.8	2404 (29.1%)	1028 (12.4%)	347	197 (57.1%)	169 (49.0%)	68.0	8268
1987	11.6	2268 (29.0%)	1306 (16.7%)	382	200 (59.0%)	175 (51.6%)	86.0	7817
1988	11.6	2307 (27.9%)	1343 (16.2%)	312	197 (54.6%)	166 (46.0%)	94.6	8267
1989	9.2	1852 (25.8%)	793 (11.0%)	212	174 (54.5%)	134 (42.0%)	68.3	7183
1990	5.4	927 (14.3%)	215 (3.3%)	177	91 (32.6%)	66 (23.7%)	46.7	6494
1991	3.1	1195 (14.4%)	138 (1.7%)	126	117 (32.3%)	61 (16.9%)	39.2	8316
1992	3.7	1103 (14.9%)	71 (1.0%)	78	109 (34.0%)	66 (20.6%)	17.7	7387
1993	3.8	1343 (16.7%)	201 (2.5%)	69	123 (35.4%)	86 (24.8%)	37.7	8061
1994	3.1	1214 (15.1%)	108 (1.3%)	57	119 (35.0%)	67 (19.7%)	19.7	8017
1995	3.3	1274 (15.2%)	73 (0.9%)	64	157 (43.1%)	64 (17.6%)	23.0	8359
1996	2.6	1043 (12.5%)	42 (0.5%)	62	112 (30.8%)	53 (14.6%)	18.8	8359
1997	2.5	1157 (13.9%)	42 (0.5%)	55	119 (32.7%)	37 (10.2%)	21.3	8347
1998	3.1	1488 (17.9%)	57 (0.7%)	51	138 (38.2%)	62 (17.2%)	26.1	8314
1999	2.4	1085 (13.4%)	44 (0.5%)	123	107 (30.2%)	43 (12.1%)	26.5	8117
2000	2.4	1079 (13.1%)	37 (0.5%)	62	105 (28.8%)	43 (11.8%)	18.4	8214
2001	2.2	1106 (13.2%)	13 (0.2%)	37	93 (25.7%)	42 (11.6%)	20.2	8352

Table 1.5
Annual Trend Summary of TRS Data at Plaza

Year	Annual Average ($\mu g/m^3$)	No. (%) of 1-Hour Values >7$\mu g/m^3$	No. (%) of 1-Hour Values >28$\mu g/m^3$	Maximum Hourly Average ($\mu g/m^3$)	No. (%) of Daily Values >3$\mu g/m^3$	No. (%) of Daily Values >6$\mu g/m^3$	Maximum Daily Average ($\mu g/m^3$)	No. of hours Instrument Operated
1980	5.9	1085 (16.0%)	449 (6.6%)	163	127 (45.0%)	85 (30.1%)	62.4	6772
1981	6.0	1276 (16.9%)	566 (7.5%)	241	136 (43.2%)	101 (32.1%)	53.8	7558
1982	5.3	1241 (15.1%)	445 (5.4%)	198	156 (45.5%)	111 (32.4%)	41.3	8235
1983	8.6	1670 (20.7%)	817 (10.1%)	177	180 (53.4%)	150 (44.5%)	90.5	8082
1984	4.7	978 (11.9%)	372 (4.5%)	227	121 (35.2%)	84 (24.4%)	51.7	8246
1985	4.8	875 (12.3%)	406 (5.7%)	297	106 (35.8%)	78 (26.4%)	81.6	7115
1986	7.9	1295 (20.1%)	677 (10.5%)	289	126 (46.8%)	102 (37.9%)	61.4	6456
1987	9.0	1806 (21.8%)	972 (11.7%)	218	174 (48.2%)	143 (39.6%)	69.0	8280
1988	7.3	1633 (19.7%)	792 (9.5%)	194	159 (44.0%)	121 (33.5%)	69.4	8297
1989	5.9	1376 (16.9%)	594 (7.3%)	184	140 (40.8%)	111 (32.4%)	41.8	8166
1990	2.7	905 (11.0%)	187 (2.3%)	122	100 (28.0%)	57 (16.0%)	47.0	8234
1991	2.2	925 (11.2%)	43 (0.5%)	58	84 (23.3%)	46 (12.8%)	19.4	8256
1992	2.1	882 (10.6%)	34 (0.4%)	69	89 (24.5%)	49 (13.5%)	18.4	8300
1993	2.4	956 (11.4%)	92 (1.1%)	72	89 (24.6%)	54 (14.9%)	29.8	8360
1994	1.9	790 (9.5%)	22 (0.3%)	67	84 (23.3%)	34 (9.4%)	19.1	8295
1995	1.9	757 (9.2%)	20 (0.2%)	44	93 (26.1%)	32 (9.0%)	20.5	8205
1996	1.7	622 (7.5%)	28 (0.3%)	103	67 (19.8%)	25 (7.0%)	27.2	8262
1997	1.6	654 (7.8%)	13 (0.2%)	40	65 (17.9%)	22 (6.0%)	12.9	8371
1998	2.2	958 (11.6%)	9 (0.1%)	50	88 (24.6%)	32 (8.9%)	19.5	8245
1999	1.7	784 (9.5%)	13 (0.2%)	44	71 (19.8%)	24 (6.7%)	18.5	8247
2000	1.5	675 (8.1%)	16 (0.2%)	45	58 (15.9%)	23 (6.3%)	21.8	8314
2001	1.7	882 (10.7%)	5 (0.1%)	35	68 (18.7%)	25 (6.9%)	21.0	8257

Table 1.6
Annual Trend Summary of TRS Data at Lakewood

Year	Annual Average ($\mu g/m^3$)	No. (%) of 1-Hour Values >7$\mu g/m^3$	No. (%) of 1-Hour Values >28$\mu g/m^3$	Maximum Hourly Average ($\mu g/m^3$)	No. (%) of Daily Values >3$\mu g/m^3$	No. (%) of Daily Values >6$\mu g/m^3$	Maximum Daily Average ($\mu g/m^3$)	No. of hours Instrument Operated
1982*	-	176 (3.0%)	22 (0.4%)	85	22 (9.1%)	13 (5.4%)	19.7	5785
1983	2.6	615 (7.9%)	147 (1.9%)	99	79 (24.5%)	43 (13.4%)	40.7	7737
1984	0.9	199 (2.4%)	15 (0.2%)	64	34 (9.9%)	10 (2.9%)	15.4	8269
1985	1.0	216 (2.9%)	28 (0.4%)	50	29 (9.3%)	12 (3.9%)	21.6	7456
1986	1.7	439. (5.6%)	110 (1.4%)	71	51 (15.7%)	32 (9.9%)	27.1	7807
1987	1.6	461 (6.0%)	106 (1.4%)	92	51 (15.6%)	34 (10.4%)	35.7	7680
1988	1.1	270 (3.6%)	38 (0.5%)	64	38 (11.8%)	23 (7.1%)	17.5	7462
1989	0.7	170 (2.8%)	33 (0.5%)	92	22 (8.1%)	8 (2.9%)	28.0	6057
1990	-	66 (1.2%)	3 (0.05%)	79	8 (3.4%)	1 (0.4%)	10.5	5484
1991	0.6	173 (2.3%)	3 (0.04%)	37	19 (5.7%)	4 (1.2%)	18.7	7667
1992	0.6	214 (2.6%)	0 (0.00%)	27	22 (6.0%)	9 (2.5%)	11.7	8351
1993	0.9	308 (4.4%)	6 (0.09%)	86	32 (10.7%)	13 (4.4%)	19.4	6952
1994	0.6	147 (1.8%)	2 (0.02%)	74	21 (5.9%)	4 (1.1%)	11.5	8196
1995	0.9	270 (3.2%)	2 (0.02%)	37	37 (10.2%)	11 (3.0%)	15.0	8358
1996	0.7	227 (2.7%)	8 (0.1%)	44	27 (7.5%)	7 (1.9%)	15.0	8281
1997	0.7	174 (2.1%)	0 (0.0%)	27	17 (4.8%)	4 (1.1%)	9.8	8211
1998	0.7	215 (2.6%)	0 (0.0%)	18	21 (6.0%)	5 (1.4%)	10.7	8204
1999	0.6	172 (2.1%)	1 (0.01%)	28	14 (4.0%)	5 (1.4%)	9.5	8191
2000	0.5	157 (1.9%)	0 (0.0%)	23	15 (4.1%)	3 (0.8%)	12.8	8348
2001	0.7	249 (3.0%)	0 (0.0%)	23	21 (5.8%)	9 (2.5%)	13.0	8345

* Instrument Operated June - December 1982

2. SULPHUR DIOXIDE (SO_2) RESULTS

Sulphur dioxide is formed primarily by the combustion of material containing sulphur. It is a colourless gas and at concentrations above 900 $\mu g/m^3$ (hourly Level B objective) has a pungent odour. At present, major sources of SO_2 in the Prince George area include the Husky refinery and the pulp mills.

The sulphur dioxide (SO_2) data are summarized in Tables 2.1- 2.3. The average annual ambient SO_2 levels were within the Provincial objectives at all stations. The Jail, Plaza, and CBC sites all recorded at least one Level A hourly exceedance. The CBC station recorded the highest one-hour average concentration (969 $\mu g/m^3$) and one exceedence of the Level B hourly objective.

B.C. Ambient Air Quality Objectives	Level A	Level B
Sulphur Dioxide (SO_2)		
One Hour Average	450 $\mu g/m^3$	900 $\mu g/m^3$
24 Hour Average	160 $\mu g/m^3$	260 $\mu g/m^3$
Annual Average	25 $\mu g/m^3$	50 $\mu g/m^3$

Table 2.1
2001 Monthly Summary of SO_2 Data at Jail

	Monthly Average	No. of 1-Hour Values		Maximum Hourly Average	No. of Daily Values		Maximum 24 Hour Average
	($\mu g/m^3$)	>450$\mu g/m^3$	>900$\mu g/m^3$	($\mu g/m^3$)	>160$\mu g/m^3$	>260$\mu g/m^3$	($\mu g/m^3$)
January	15.9	1	0	458	0	0	164.7
February	26.7	0	0	386	0	0	78.9
March	9.2	0	0	152	0	0	71.6
April	11.6	0	0	210	0	0	49.3
May	5.9	0	0	128	0	0	57.8
June	7.4	0	0	120	0	0	49.8
July	5.2	0	0	194	0	0	33.7
August	16.9	0	0	399	0	0	130.3
September	14.5	0	0	282	0	0	67.2
October	6.3	0	0	240	0	0	54.4
November	10.6	0	0	117	0	0	56.1
December	15.8	0	0	205	0	0	49.3
Annual	**12.1**	**1**	**0**	**458**	**0**	**0**	**164.7**

Table 2.2
2001 Monthly Summary of SO_2 Data at Plaza

	Monthly Average ($\mu g/m^3$)	No. of 1-Hour Values		Maximum Hourly Average ($\mu g/m^3$)	No. of Daily Values		Maximum 24 Hour Average ($\mu g/m^3$)
		>450$\mu g/m^3$	>900$\mu g/m^3$		>160$\mu g/m^3$	>260$\mu g/m^3$	
January	17.8	1	0	455	1	0	172.6
February	17.0	0	0	264	0	0	54.3
March	3.3	0	0	75	0	0	15.8
April	5.5	0	0	130	0	0	23.3
May	2.8	0	0	64	0	0	12.7
June	4.0	0	0	72	0	0	12.1
July	3.2	0	0	101	0	0	12.3
August	13.9	0	0	405	0	0	80.4
September	14.0	0	0	352	0	0	60.5
October	5.3	0	0	194	0	0	45.8
November	9.1	0	0	80	0	0	41.3
December	18.5	0	0	186	0	0	65.8
Annual	**9.5**	**1**	**0**	**455**	**1**	**0**	**172.6**

Table 2.3
2001 Monthly Summary of SO_2 Data at CBC

	Monthly Average ($\mu g/m^3$)	No. of 1-Hour Values		Maximum Hourly Average ($\mu g/m^3$)	No. of Daily Values		Maximum 24 Hour Average ($\mu g/m^3$)
		>450$\mu g/m^3$	>900$\mu g/m^3$		>160$\mu g/m^3$	>260$\mu g/m^3$	
January	29.7	1	0	740	2	0	193.7
February	35.7	0	0	450	1	0	173.4
March	10.6	0	0	256	0	0	68.3
April	8.9	0	0	439	0	0	53.3
May	5.0	0	0	152	0	0	33.7
June	7.5	0	0	407	0	0	48.2
July	6.1	0	0	290	0	0	58.6
August	19.2	4	1	969	0	0	159.5
September	20.9	0	0	325	0	0	113.6
October	7.9	0	0	450	0	0	118.6
November	20.8	3	0	522	1	0	193.2
December	23.4	2	0	613	0	0	135.4
Annual	**16.2**	**10**	**1**	**969**	**4**	**0**	**193.7**

2.1 SO_2 Annual Trends

Table 2.4 summarizes the annual trend of SO_2 data collected at the Jail station. Prior to 1986, data was obtained from a Philips SO_2 continuous analyzer which was subject to interference from various TRS compounds resulting in erroneous data. In 1986 the Philips analyzer was replaced with a TECO analyzer utilizing newer technology. The SO_2 average for 1986 is based upon Philips data for Jan. - Feb. and TECO monitor data for Mar. - Dec. The lower annual averages after 1986 are attributable to the improved accuracy of data provided by the new monitor.

Annual average SO_2 levels at the Jail increased from 1990 to 1996. Since 1996, SO_2 levels have been decreasing at this site. The annual concentration at the Jail site in 2001 increased relative to the previous two years. A similar increase was recorded at the Plaza and CBC (Tables 2.5 and 2.6, respectively).

Table 2.4
Annual Trend Summary of SO_2 Data at Jail

Year	Annual Average ($\mu g/m^3$)	No. of 1-Hour Values >450$\mu g/m^3$	No. of 1-Hour Values >900$\mu g/m^3$	Maximum Hourly Average ($\mu g/m^3$)	No. of Daily Values >160$\mu g/m^3$	No. of Daily Values >260$\mu g/m^3$	Maximum Daily Average ($\mu g/m^3$)	No. of Hours Instrument Operated
1981	10.7	1	0	506	0	0	75.2	7,016
1982	25.5	1	0	719	0	0	161.4	6,535
1983	31.8	1	0	533	0	0	143.5	8,310
1984	22.9	6	1	1198	3	0	242.8	7,551
1985	21.0	0	0	399	0	0	119.3	7,860
1986*	16.9	4	0	538	0	0	152.5	8,278
1987	12.8	2	0	666	0	0	123.0	8,348
1988	13.8	8	0	586	1	0	173.8	8,412
1989	12.0	1	0	659	0	0	99.6	8,165
1990	5.5	0	0	283	0	0	56.7	6,719
1991	8.7	1	0	492	0	0	118.1	8,236
1992	12.1	1	0	450	0	0	104.0	8,363
1993	10.9	0	0	363	0	0	81.8	8,225
1994	12.5	1	0	469	0	0	123.0	8,162
1995	20.5	1	0	530	0	0	118.8	8,354
1996	23.7	10	0	735	2	0	189.8	8,368
1997	20.5	4	0	759	0	0	143.2	8,350
1998	18.6	1	0	469	0	0	129.0	7,580
1999	10.0	0	0	306	0	0	103.9	8,358
2000	9.0	0	0	415	0	0	96.3	8,362
2001	12.1	1	0	458	1	0	164.7	8,348

* Philips analyzer was replaced with a TECO analyzer

Table 2.5
Annual Trend Summary of SO_2 Data at Plaza

Year	Annual Average ($\mu g/m^3$)	No. of 1-Hour Values >450$\mu g/m^3$	>900$\mu g/m^3$	Maximum Hourly Average ($\mu g/m^3$)	No. of Daily Values >160$\mu g/m^3$	>260$\mu g/m^3$	Maximum Daily Average ($\mu g/m^3$)	No. of Hours Instrument Operated
1995	-	2	0	474	0	0	156.3	5,323*
1996	15.8	13	1	913	1	0	167.9	8,229
1997	14.6	8	0	663	0	0	118.3	8,363
1998	11.9	0	0	399	0	0	93.5	8,220
1999	7.2	1	0	490	0	0	105.3	8,703
2000	7.4	0	0	341	0	0	58.7	8,071
2001	9.5	1	0	455	1	0	173.0	8,340

* Instrument installed May 1995

Table 2.6
Annual Trend Summary of SO_2 Data at CBC

Year	Annual Average ($\mu g/m^3$)	No. of 1-Hour Values >450$\mu g/m^3$	>900$\mu g/m^3$	Maximum Hourly Average ($\mu g/m^3$)	No. of Daily Values >160$\mu g/m^3$	>260$\mu g/m^3$	Maximum Daily Average ($\mu g/m^3$)	No. of Hours Instrument Operated
1995	-	4	0	597	0	0	101.1	5,096*
1996	23.9	10	0	794	4	0	189.3	8,370
1997	20.1	9	0	778	2	0	197.7	8,312
1998	22.6	10	0	597	1	0	224.0	8,361
1999	13.0	11	0	751	1	0	227.1	8,560
2000	-	2	0	519	0	0	142.4	6,958
2001	16.2	10	1	969	4	0	193.7	8,347

* Instrument installed May 1995

3. NITROGEN DIOXIDE (NO_2) RESULTS

Nitrogen dioxide is a reddish-brown gas with a pungent and irritating odour over 250 $\mu g/m^3$. The NO_2 absorbs short wave blue light, leaving longer wavelengths that cause it to appear reddish-brown.

NO_2 is emitted as a primary pollutant (emitted directly from high temperature combustion sources) or a secondary pollutant (produce from the oxidation of nitric oxide). Nitric oxide is formed during high temperature combustion, primarily from motor vehicle exhausts and stationary combustion (such as industrial processes, waste incineration, and fuel combustion for heating homes and buildings). Emissions of nitric oxide are greater during winter months when there is an increase in the use of heating fuels and in the idling of cars.

The nitrogen dioxide data from the Plaza site is summarized in Tables 3.1. Ambient NO_2 levels were well within the Provincial objectives, with no Level A hourly or daily exceedances.

Table 3.1.
2001 Monthly Summary of NO_2 Data at Plaza

	Monthly Average	No. of 1-Hour Values		Maximum Hourly Average	No. of Daily Values		Maximum 24 Hour Average
	($\mu g/m^3$)	>400$\mu g/m^3$	>1000$\mu g/m^3$	($\mu g/m^3$)	>200$\mu g/m^3$	>300$\mu g/m^3$	($\mu g/m^3$)
January	37.6	0	0	111	0	0	66.0
February	39.8	0	0	111	0	0	81.5
March	25.7	0	0	101	0	0	57.1
April	26.1	0	0	92	0	0	47.0
May	16.3	0	0	82	0	0	29.6
June	13.0	0	0	57	0	0	25.3
July	10.3	0	0	48	0	0	22.9
August	19.2	0	0	92	0	0	46.7
September	19.6	0	0	84	0	0	37.3
October	20.1	0	0	65	0	0	37.0
November	22.5	0	0	65	0	0	43.6
December	27.8	0	0	94	0	0	56.9
Annual	**23.0**	**0**	**0**	**111**	**0**	**0**	**81.5**

B.C. Ambient Air Quality Objectives ..... Level B Level C
Nitrogen Dioxide (NO_2)

One Hour Average	400 $\mu g/m^3$	1000 $\mu g/m^3$
24 Hour Average	200 $\mu g/m^3$	300 $\mu g/m^3$
Annual Average	60 $\mu g/m^3$	100 $\mu g/m^3$

3.1 NO_2 Annual Trends

Trends were not assessed previously due to periods of missing data in 1995 and 2000. The annual average in 2001 was the lowest ever recorded at Plaza (Table 3.2).

Table 3.2
Annual Trend Summary of NO_2 Data at Plaza

Year	Annual Average ($\mu g/m^3$)	No. of 1-Hour Values >400$\mu g/m^3$	>1000$\mu g/m^3$	Maximum Hourly Average ($\mu g/m^3$)	No. of Daily Values >200$\mu g/m^3$	>300$\mu g/m^3$	Maximum Daily Average ($\mu g/m^3$)	No. of Hours Instrument Operated
1992	-	0	0	61	0	0	97.0	4,825*
1993	25.4	0	0	149	0	0	83.3	8,072
1994	23.7	0	0	130	0	0	70.7	7,852
1995	-	0	0	101	0	0	61.5	4,957**
1996	25.9	0	0	151	0	0	84.6	7,787
1997	24.3	0	0	186	0	0	91.5	8,242
1998	28.7	0	0	143	0	0	67.1	8,051
1999	25.6	0	0	143	0	0	99.1	8,218
2000	-	0	0	149	0	0	81.9	5,070**
2001	23.0	0	0	111	0	0	81.5	8,295

* Note: NO_2 TECO Analyzer Installed in June 1992
** Note NO_2 TECO Operational Problems

4. OZONE (O_3) RESULTS

Ground level ozone is produced when oxides of nitrogen (NO_x) react with volatile hydrocarbons in the presence of sun light. Ozone is termed a secondary pollutant because it is produced from a photochemical reaction involving primary pollutants (NO_x and volatile hydrocarbons).

Tables 4.1 summarizes the ozone data recorded at the Plaza station. The maximum one-hour level (170 $\mu g/m^3$) was recorded on August 15th. The greatest number of exceedances of the one-hour objective occurred in May. Exceedances of the Level B one-hour objective were recorded for the first time in Prince George in August 2001. Exceedances of the 24-hour Level A objective occurred nine or more days in every month in 2001. Exceedance of the 24-hour Level B objective occurred for at least 2 or more days in every month in 2001. Monthly averages for March, April and May were higher than the 24-hour Level B objective.

Table 4.1
2001 Monthly Summary of O_3 Data for Plaza

	Monthly Average ($\mu g/m^3$)	No. of 1-Hour Values		Maximum Hourly Average ($\mu g/m^3$)	No. of Daily Values		Maximum 24 Hour Average ($\mu g/m^3$)
		>100$\mu g/m^3$	>160$\mu g/m^3$		>30$\mu g/m^3$	>50$\mu g/m^3$	
January	27.3	0	0	86	13	6	64.6
February	34.3	0	0	98	14	5	86.3
March	57.1	3	0	102	27	21	91.1
April	62.3	45	0	112	30	25	99.5
May	69.4	71	0	118	31	27	98.3
June	45.0	5	0	112	26	10	79.1
July	36.4	0	0	96	22	4	61.6
August	35.3	38	2	170	21	3	56.0
September	27.0	10	0	142	9	1	54.5
October	37.4	0	0	90	19	5	76.8
November	30.5	0	0	84	16	5	66.8
December	26.4	0	0	82	10	5	73.9
Annual	**40.7**	**172**	**2**	**170**	**238**	**117**	**99.5**

B.C. Ambient Air Quality Objectives	Level A	Level B
Ozone (O_3)		
One Hour Average	100 $\mu g/m^3$	160 $\mu g/m^3$
24 Hour Average	30 $\mu g/m^3$	50 $\mu g/m^3$
Annual Average		30 $\mu g/m^3$

4.1 O_3 Annual Trends

Annual averages, since monitoring started in 1995, have been gradually increasing at the Plaza site. The annual average O_3 level in 2001 was the highest ever recorded at this site, but there were more hourly exceedances of the Level A one-hour objective in 2000. Exceedances of the Daily Level A and B objectives were higher in 2001 than any other previous year.

Table 4.2
Annual Trend Summary of O_3 Data at Plaza

Year	Annual Average ($\mu g/m^3$)	No. (%) of 1-Hour Values >100$\mu g/m^3$	No. (%) of 1-Hour Values >160$\mu g/m^3$	Maximum Hourly Average ($\mu g/m^3$)	No. (%) of Daily Values >30$\mu g/m^3$	No. (%) of Daily Values >50$\mu g/m^3$	Maximum Daily Average ($\mu g/m^3$)	No. of Hours Instrument Operated
1995	-	30 (0.5%)	0	112	109 (45.2%)	32 (13.3%)	75.2	5,548*
1996	35.2	21 (0.3%)	0	120	209 (58.2%)	87 (24.2%)	88.1	8,290
1997	35.3	57 (0.7%)	0	120	217 (59.6%)	87 (23.9%)	82.7	8,358
1998	37.3	166 (2.0%)	0	156	217 (60.3%)	93 (25.8%)	85.0	8,284
1999	38.2	153 (1.9%)	0	140	223 (61.9%)	94 (26.1%)	103.3	8,265
2000	36.4	182 (2.2%)	0	132	200 (55.1%)	89 (24.5%)	96.2	8,309
2001	40.7	172 (2.0%)	2	170	238 (65.2%)	117 (32.1%)	90.0	8,319

* Note: O_3 API Analyzer installed in late April 1995

5. PARTICULATE MATTER (PM_{10}) RESULTS

Particulate matter refers to small particles ranging in size from 0.001 µm (micrometres) to 100 µm. Particles range in chemical composition, size, shape, and physical properties. Sources of particles are either natural sources such as pollen, dust from soil erosion, volcanoes or man-made sources such as soot, flyash and smoke. In Prince George sources of particulate are pulp mills, road dust, sawmills, motor vehicles, burning of fuels for heating, and some natural sources.

Larger particulate may cause a nuisance or irritation problem, but smaller particles (less than 10 µm) cause the greatest health effect because they are inhaled deep into the lung cavities. Particles in this size range usually come from man-made sources, internal combustion engines, industrial processes, burning, and road dust.

Particulate matter less than 10 micrometres (PM_{10}) is measured either non-continuously (once every sixth day when samplers are run for 24 hours at a time) (four locations in Prince George), or continuously, using a tapered element oscillating microbalance technology (TEOM).

Table 5.1 summarizes the PM_{10} data from both the continuous and non-continuous monitors in Prince George for 2001. Annual averages ranged from a low of 13.5 $\mu g/m^3$ at Gladstone to a maximum of 20.1 $\mu g/m^3$ at the BCR site. The maximum 24-hour average, 110 $\mu g/m^3$, was recorded at the Plaza site.

Table 5.1
2001 Airshed Summary of PM_{10}

Station	Annual Average ($\mu g/m^3$)	No. (%) of Daily Values		Maximum Daily ($\mu g/m^3$)	Minimum Daily ($\mu g/m^3$)	No. of Values
		>50$\mu g/m^3$	>100$\mu g/m^3$			
Plaza	15.7	2 (3.3%)	0	52	4	60
Plaza - (TEOM)	18.1	9 (2.6%)	1	110	2	345
Lakewood	13.9	1 (1.7%)	0	52	1	58
Van Bien	17.4	1 (1.7%)	0	61	4	60
CNR	18.0	3 (4.9%)	0	56	4	61
BCR	20.1	17 (4.7%)	0	98	3	364
Gladstone	13.5	2 (0.6%)	0	78	1	361
Hart-Glenview	-	2 (4.4%)	0	77.0	3	45

B.C. Ambient Air Quality Objectives for PM_{10}: .....Level B
24 Hour ..... 50 $\mu g/m^3$

5.1 PM_{10} Continuous Monitors Results

PM_{10} is continuously sampled on top of the Plaza 400 building, Gladstone Elementary, Glenview School and the BCR Warehouse with a TEOM 1400a PM_{10} sampler. Tables 5.2 to 5.5 summarize the PM_{10} monitoring data at the four continuous monitoring sites in Prince George. Monthly concentrations ranged from 9.2 $\mu g/m^3$ (at Gladstone in July) to 28.3 $\mu g/m^3$ (at BCR in August). The maximum hourly concentration of 387 $\mu g/m^3$ was recorded at BCR in April and the maximum 24-hour level (109.6 $\mu g/m^3$) was recorded at Plaza in January.

Table 5.2
2001 Monthly Summary of Continuous PM_{10} Data at Plaza

	Monthly Average ($\mu g/m^3$)	Maximum Hourly ($\mu g/m^3$)	No. of Daily Values		Maximum 24 Hour ($\mu g/m^3$)	Minimum 24 Hour ($\mu g/m^3$)
			>50$\mu g/m^3$	>100$\mu g/m^3$		
January	18.9	170	1	1	109.6	2.0
February	26.4	137	5	0	69.8	3.5
March	19.2	127	0	0	44.8	7.1
April	23.5	150	0	0	59.7	4.6
May	13.9	147	0	0	33.0	5.0
June	13.6	96	0	0	36.3	3.9
July	12.8	68	0	0	30.6	3.5
August	23.1	144	3	0	58.8	4.6
September	19.9	118	0	0	54.0	5.3
October	14.1	74	0	0	41.4	3.3
November	14.2	61	0	0	29.3	4.1
December	17.4	83	0	0	43.4	2.6
Annual	**18.1**	**170**	**9**	**1**	**109.6**	**2.0**

Table 5.3
2001 Monthly Summary of Continuous PM_{10} Data at Gladstone

	Monthly Average ($\mu g/m^3$)	Maximum Hourly ($\mu g/m^3$)	No. of Daily Values		Maximum 24 Hour ($\mu g/m^3$)	Minimum 24 Hour ($\mu g/m^3$)
			>50$\mu g/m^3$	>100$\mu g/m^3$		
January	15.4	101	1	0	78.0	1.0
February	22.1	91	1	0	59.0	2.7
March	12.6	126	0	0	35.8	3.8
April	14.3	85	0	0	38.9	4.0
May	9.6	54	0	0	20.0	3.8
June	9.3	45	0	0	20.6	3.4
July	9.2	49	0	0	19.5	3.3
August	15.8	112	0	0	47.1	2.9
September	14.0	80	0	0	41.4	5.1
October	10.9	164	0	0	46.2	3.6
November	13.4	69	0	0	33.5	4.3
December	15.6	63	0	0	39.3	2.7
Annual	**13.5**	**164**	**2**	**0**	**78.0**	**1.0**

Table 5.4
2001 Monthly Summary of Continuous PM_{10} Data at BCR

	Monthly Average ($\mu g/m^3$)	Maximum Hourly ($\mu g/m^3$)	No. of Daily Values		Maximum 24 Hour ($\mu g/m^3$)	Minimum 24 Hour ($\mu g/m^3$)
			>50$\mu g/m^3$	>100$\mu g/m^3$		
January	20.0	130	1	0	97.8	2.5
February	27.5	125	4	0	67.9	4.9
March	18.8	154	0	0	53.0	4.9
April	27.0	387	4	0	75.2	4.3
May	16.8	145	0	0	43.0	4.3
June	15.6	122	0	0	50.9	3.8
July	14.2	146	0	0	40.8	3.4
August	28.3	280	5	0	89.1	5.0
September	23.5	186	2	0	60.1	6.7
October	16.1	111	1	0	56.8	4.1
November	16.2	68	0	0	42.7	4.8
December	18.2	82	0	0	53.0	2.5
Annual	**20.1**	**387**	**17**	**0**	**97.8**	**2.5**

Table 5.5
2001 Monthly Summary of Continuous PM_{10} Data at Hart Highlands - Glenview

	Monthly Average ($\mu g/m^3$)	Maximum Hourly ($\mu g/m^3$)	No. of Daily Values		Maximum 24 Hour ($\mu g/m^3$)	Minimum 24 Hour ($\mu g/m^3$)
			>50$\mu g/m^3$	>100$\mu g/m^3$		
January	11.5	137	2	0	77.0	3.3
February	11.8	89	0	0	40.8	3.7
March *	-	-	-	-	-	-
Annual	-	**137**	**2**	**0**	**77.0**	**3.3**

* Instrument removed February 15/01

5.3 PM_{10} Annual Trends (Continuous Monitors)

In 2001, the annual average at all three continuous monitoring sites were about the same (within 0.1 $\mu g/m^3$) as the previous year. The TEOM monitor at Plaza was sent for upgrades at the end of 1993. The annual averages of the TEOM have usually been lower than the average from the non-continuous monitor, but the 2001 data showed the opposite relationship. Decreasing trends are shown for both monitors since 1995.

The TEOM located at Glenview School (Table 5.9) has been operating from June 1998 to February 2001, which is not long enough for any trend discussion. The other three sites are showing a decrease in annual levels, including exceedances of the 24-hour objective.

Table 5.6
Annual Trend Summary of the Continuous PM_{10} Data at Plaza

Year	Annual Average ($\mu g/m^3$)	Maximum Hourly Average ($\mu g/m^3$)	No. (%) of Days > 50 $\mu g/m^3$	No. (%) of Days > 100 $\mu g/m^3$	Maximum Daily Average ($\mu g/m^3$)	Hours Instrument Operated
1992	21.6	488	18 (6.1%)	0 (0%)	80	7,083
1993	22.3	171	11 (4.5%)	0 (0%)	75	5,828
1994*	22.3	284	19 (5.6%)	4 (1.2%)	117	8,162
1995	24.2	291	33 (9.1%)	2 (0.6%)	108	8,686
1996	20.5	373	10 (2.8%)	3 (0.8%)	152	8,567
1997	20.2	208	13 (3.6%)	0 (0%)	76	8,719
1998	22.7	319	20 (5.5%)	2 (0.5%)	114	8,719
1999	17.8	211	10 (2.7%)	0 (0%)	98	8,609
2000	18.0	175	9 (2.5%)	0 (0%)	71	8,695
2001	18.1	170	9 (2.6%)	1 (0.3%)	110	8,442

* Monitor returned in January after upgrades

Table 5.7
Annual Trend Summary of the Continuous PM_{10} Data at Gladstone

Year	Annual Average ($\mu g/m^3$)	Maximum Hourly Average ($\mu g/m^3$)	No. (%) of Days > 50 $\mu g/m^3$	No. (%) of Days > 100 $\mu g/m^3$	Maximum Daily Average ($\mu g/m^3$)	Hours Instrument Operated
1996	15.0	253	7 (1.9%)	1 (0.3%)	102	8,688
1997	14.8	155	7 (1.9%)	0 (0%)	61	8,673
1998	17.2	207	7 (1.9%)	0 (0%)	74	8,642
1999	12.7	127	0 0	0 (0%)	47	8,663
2000	13.6	148	4 (1.1%)	0 (0%)	55	8,686
2001	13.5	164	2 (0.6%)	0 (0%)	78	8,610

Table 5.8
Annual Trend Summary of the Continuous PM_{10} Data at BCR

Year	Annual Average ($\mu g/m^3$)	Maximum Hourly Average ($\mu g/m^3$)	No. (%) of Days > 50 $\mu g/m^3$	No. (%) of Days > 100 $\mu g/m^3$	Maximum Daily Average ($\mu g/m^3$)	Hours Instrument Operated
1996*	-	125	5 (5.3%)	0 (0%)	68	2,263
1997	24.2	401	32 (8.8%)	2 (0.5%)	111	8,705
1998	29.1	582	49 (13.5%)	4 (1.1%)	127	8,702
1999	21.3	380	19 (5.5%)	0 (0%)	79	8,718
2000	20.0	288	13 (3.6%)	0 (0%)	86	8,739
2001	20.1	387	17 (4.7%)	0 (0%)	98	8,634

* analyzer installed in October 1996

Table 5.9
Annual Trend Summary of the Continuous PM_{10} Data at Glenview

Year	Annual Average ($\mu g/m^3$)	Maximum Hourly Average ($\mu g/m^3$)	No. (%) of Days > 50 $\mu g/m^3$	No. (%) of Days > 100 $\mu g/m^3$	Maximum Daily Average ($\mu g/m^3$)	Hours Instrument Operated
1998	-	117	0 (0%)	0 (0%)	38	4,852*
1999	9.2	221	0 (0%)	0 (0%)	34	8,670
2000	9.9	153	0 (0%)	0 (0%)	49	8,731
2001	-	137	2 (4.4%)	0 (0%)	77	1,090**

*Note: Monitoring started June 1998
** Note: Instrument removed Feb. 15/01

5.4 PM_{10} Annual Trends (Non-continuous Monitors)

Similar to the continuous TEOM monitors, some non-continuous stations showed lower annual average PM_{10} levels in 2001 compared to the previous year, and other were similar to the previous year. Tables 5.10 - 5.13 show the annual summary of PM_{10} data from these monitoring sites. Greater year-to-year fluctuations in averages and exceedance rates are produced by the non-continuous monitoring because of the lower level of sampling (60 samples verses about 360 TEOM samples).

Table 5.10
Annual Trend Summary of Non-Continuous PM_{10} Data at Plaza

Year	Annual Average ($\mu g/m^3$)	No. (%) of Daily Values > 50 $\mu g/m^3$	No. (%) of Daily Values > 100 $\mu g/m^3$	Maximum Daily Value ($\mu g/m^3$)	Number of Samples
1990	-	2 (7.7%)	0	90	26
1991	29.4	7 (11.7%)	1 (1.7%)	217	60
1992	28.6	6 (10.2%)	0	92	59
1993	30.2	10 (16.7%)	0	92	60
1994	24.1	6 (10.0%)	0	85	61
1995	23.6	4 (6.6%)	0	85	61
1996	21.7	2 (3.5%)	0	61	61
1997	20.8	1 (1.7%)	0	56	61
1998	26.9	5 (8.2%)	1 (1.6%)	111	61
1999	21.3	2 (3.3%)	0	73	61
2000	19.0	1 (1.7%)	0	65	59
2001	15.7	2 (3.3%)	0	52	60

Table 5.11
Annual Trend Summary of Non-Continuous PM_{10} Data at Van Bien

Year	Annual Average ($\mu g/m^3$)	No. (%) of Daily Values > 50 $\mu g/m^3$	No. (%) of Daily Values > 100 $\mu g/m^3$	Maximum Daily Value ($\mu g/m^3$)	Number of Samples
1990	-	7 (26.9%)	0	62	26
1991	27.6	8 (13.6%)	0	84	59
1992	27.0	7 (12.5%)	0	89	56
1993	27.9	6 (10.2%)	0	99	59
1994	21.8	3 (6.3%)	0	69	48
1995	25.2	6 (10.2%)	1 (1.7%)	106	59
1996	23.9	4 (7.3%)	0	67	59
1997	20.8	3 (5.3%)	0	74	57
1998	28.4	6 (10.9%)	0	91	55
1999	22.7	3 (5.2%)	0	56	58
2000	17.4	2 (3.5%)	0	84	57
2001	17.4	1 (1.7%)	0	61	60

Table 5.12
Annual Trend Summary of Non-Continuous PM_{10} Data at Lakewood

Year	Annual Average ($\mu g/m^3$)	No. (%) of Daily Values > 50 $\mu g/m^3$	No. (%) of Daily Values > 100 $\mu g/m^3$	Maximum Daily Value ($\mu g/m^3$)	Number of Samples
1990	17.4	0	0	40	24*
1991	21.8	5 (8.5%)	0	89	59
1992	24.8	7 (11.9%)	0	74	59
1993	27.3	4 (7.6%)	1 (1.9%)	129	53
1994	18.9	1 (1.7%)	0	56	58
1995	18.7	4 (7.4%)	0	63	54
1996	16.3	0	0	50	59
1997	15.9	1 (1.7%)	0	51	59
1998	19.8	1 (1.9%)	0	61	54
1999	17.4	1 (1.8%)	0	74	56
2000	14.1	0	0	50	60
2001	13.9	1 (1.7%)	0	52	58

* Note: High volume samplers converted to PM_{10} (August 1,1990).

Table 5.13
Annual Trend Summary of Non-Continuous PM_{10} Data at the CNR Site

Year	Annual Average ($\mu g/m^3$)	No. (%) of Daily Values > 50 $\mu g/m^3$	No. (%) of Daily Values > 100 $\mu g/m^3$	Maximum Daily Value ($\mu g/m^3$)	Number of Samples
1991	30.9	5 (13.2%)	2 (5.3%)	124	38
1992	28.3	6 (10.3%)	1 (1.7%)	103	58
1993	33.3	14 (23.0%)	1 (1.6%)	104	61
1994	25.2	8 (13.6%)	0	75	59
1995	27.5	8 (13.3%)	1 (1.7%)	110	60
1996	28.1	5 (8.3%)	1 (1.7%)	110	60
1997	22.8	2 (3.6%)	0	65	55
1998	34.0	8 (13.8%)	2 (3.4%)	124	58
1999	28.0	8 (13.6%)	1 (1.7%)	106	59
2000	21.3	3 (5.1%)	0	61	59
2001	18.0	3 (4.9%)	0	56	61

5.5 $PM_{2.5}$ Results

The Ministry operates one continuous $PM_{2.5}$ (particulate matter less than 2.5 micrometres) monitor, which is located at the Plaza site. The highest monthly average occurred in February and the lowest in June. The maximum hourly and daily averages occurred in January.

Table 5.14
2001 Monthly Summary of Continuous $PM_{2.5}$ Data at Plaza

	Monthly Average ($\mu g/m^3$)	Maximum Hourly ($\mu g/m^3$)	No. of Daily Values		Maximum 24 Hour ($\mu g/m^3$)	Minimum 24 Hour ($\mu g/m^3$)
			>30$\mu g/m^3$	>50$\mu g/m^3$		
January	10.3	140	1	1	57.9	1.1
February	16.2	97	5	0	48.7	0.6
March	7.9	48	0	0	21.7	1.2
April	10.0	62	0	0	26.1	1.5
May	6.6	73	0	0	17.8	1.3
June	6.2	43	0	0	15.5	1.0
July	6.3	52	0	0	17.5	0.9
August	13.6	119	4	0	37.9	1.8
September	10.5	88	1	0	37.6	2.0
October	6.7	42	0	0	22.7	1.5
November	7.4	31	0	0	17.5	1.7
December	10.9	67	0	0	31.9	0.2
Annual	**9.4**	**140**	**11**	**1**	**57.9**	**0.2**

5.6 $PM_{2.5}$ Annual Trend (Non-continuous Monitor)

The Ministry operates one non-continuous $PM_{2.5}$ monitor, which is located at the Plaza site. Tables 5.15 and 5-16 show the annual trend summary of $PM_{2.5}$ data for the non-continuous and continuous monitors, respectively at Plaza. Following a national review of continuous PM2.5 data collected with the Ruprecht and Patashnuk TEOM monitors, two correlation factors were adjusted, and the full five year database was revised. No trend is evident in the four year continuous record. The non-continuous monitoring record shows a substantial decrease in annual averages from 1995 to 2001, with 2001 averages similar to the continuous one. Based on a comparison of the non-continuous and continuous $PM_{2.5}$ values for 1998 through 2001, and a comparison of the 6-day and continuous PM_{10} values for 1995 through 2001, this decreasing trend in annual $PM_{2.5}$ values was found to be accurate.

Table 5.15
Annual Trend Summary of Non-Continuous $PM_{2.5}$ Data at Plaza

Year	Annual Average ($\mu g/m^3$)	No. (%) of Daily Values > 25 $\mu g/m^3$	No. (%) of Daily Values > 50 $\mu g/m^3$	Maximum Daily Value ($\mu g/m^3$)	Number of Samples
1994*	-	1 (4.5%)	1 (4.5%)	52	22
1995	13.3	5 (8.8%)	1 (1.8%)	54	61
1996	12.7	4 (6.7%)	0	40	60
1997	12.3	6 (9.8%)	0	43	61
1998	11.3	5 (8.2%)	1 (1.7%)	52	61
1999	9.6	2 (3.3%)	0	38	60
2000	11.5	6 (10.5%)	1 (1.7%)	52	61
2001	9.5	3 (5.8%)	0	31	52

* Instrument installed August 1994

Table 5.16
Annual Trend Summary of the Continuous $PM_{2.5}$ Data at Plaza

Year	Annual Average ($\mu g/m^3$)	Maximum Hourly Average ($\mu g/m^3$)	No. (%) of Days > 30 $\mu g/m^3$		No. (%) of Days > 50 $\mu g/m^3$		Maximum Daily Average ($\mu g/m^3$)	Hours Instrument Operated
1997	-	87	6	(12.2%)	1	(2.0%)	55.4	1,167*
1998	9.6	119	7	(1.9%)	1	(0.3%)	52.1	8,722
1999	7.9	117	4	(1.1%)	0	(0%)	34.1	8,657
2000	9.5	92	11	(3.0%)	0	(0%)	47.0	8,610
2001	9.4	140	11	(3.1%)	1	(0%)	57.9	8,373

*Note: Monitoring started Sept. 1997